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| 10/081,860      | 02/22/2002  | Alexander Bietsch    |                     | 4336             |

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 01/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/081,860

Applicant(s)

BIETSCH ET AL.

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 22-45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 14-21 is/are rejected.
- 7) ☐ Claim(s) 11-13 is/are objected to.
- 8) ☐ Claim(s) 22-45 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-21, drawn to an etching composition, classified in class 252, subclass 79.1.
  - II. Claims 22-45, drawn to an etching method, classified in class 216, subclass 41.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the product as claimed can be used in a materially different process of using that product such as one that does not requires spraying the liquid etchant onto the substrate.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and recognized divergent subject matter, and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.
4. A telephone called was made by Roberts Culbert to Thomas Beck. During a telephone conversation with Thomas Beck on 12/6/04 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-21. Affirmation of this

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election must be made by applicant in replying to this Office action. Claims 22-45 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### ***Claim Objections***

5. Claim 17 is objected to because of the following informalities:  
“poly(ethylen glycol)” is misspelled. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5, 7-9, 14, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Everhart et al. (US 6,060,256).

Everhart teaches gold samples were coated with an ethanol solution of hexadecane thio (HDT) to form a SAM (self assembling monolayer) and then etched in

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an aqueous solution of potassium cyanide containing potassium hydroxide while bubbling air (oxygen), (column 12, lines 48-58), which reads on

A wet etching system for selectively patterning substrate having regions covered with self-assembled monolayers (SAMs), thereby controlling the etch profile, said system comprising:

a) a liquid etching solution; and

b) at least one additive to said liquid etching solution having a higher affinity to the regions of said substrate covered with SAMs than to the other regions of said substrate, **in claim 1;**

wherein said etching solution comprises a KCN/Oxygen etching composition, **in claim 2;**

wherein said at least one additive is nonpolar and is adapted to form an ordered layer on said substrate, **in claim 3;**

wherein said nonpolar additive comprises a compound having an alkyl chain and a small polar head group, **in claim 4;**

wherein said compound is selected from the group consisting of alcohols, carboxylic acids, amines, sulfates, phosphates and alkanethiols, **in claim 5;**

wherein said compound is alkanethiol, which is a linear alkanethiol of the general formula  $\text{HS}-(\text{CH}_2)_{n-1}-\text{CH}_3$ , where  $6 < n < 24$ , **in claims 7 and 8, and**

wherein said alkanethiol is hexadecanethiol, **in claim 9;**

which contains additionally a second additive, **in claim 14;** and

wherein said substrate is selected from the group consisting of Au, Ag, Pd and Cu, in claim 19.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Everhart (US '256), as applied to claim 1 above.

Everhart differs in failing to teach wherein said compound is 1-octanol.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to replace Everhart's ethanol with octanol because these

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chemicals are seen as equivalent for the purpose of providing a solvent medium for nonpolar materials.

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Everhart (US '256), as applied to claim 1 above.

Everhart differs in failing to teach said hexadecanethiol is present in a concentration in the range of about 0.005 mM to about 0.07mM, preferably 0.2mM.

However, the reference illustrates that the specific thiol is known. As a result, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any concentration of hexadecanethiol in the reference of Everhart that would effectively accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

12. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Everhart (US '256) as applied to claim 1 above, and further in view of Fjare (US 5,292,445).

Everhart differs in failing to teach wherein second additive is a surfactant, wherein said surfactant is poly(ethyleneglycol), and wherein said poly(ethyleneglycol) is dodecylhexa(ethyleneglycol), respectively in claims **15-17**; and wherein said C<sub>12</sub>PEG<sub>6</sub> is present in a concentration in the range of 0.5 mM to about 10 mM, preferably 2 mM, **in claim 18**.

Fjare teaches a wet-etch composition that includes a polymer additive with surfactant properties and which includes polyethylene glycol (column 11, lines 25-30) and also teaches the surfactant is added to the etch composition at approximately 0.01 to approximately 1.0 weight percent of the total wet-etch composition (column 11, lines 21-24), which encompasses, said C<sub>12</sub>PEG<sub>6</sub> is present in a concentration in the range of about 0.5 mM to about 10 mM, preferably 2mM, **in claim 18**.

Since the class of polyethylene glycols are known surfactants, then it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Everhart by using a class of polyethylene glycol surfactants having known concentrations (weight percent) as taught by Fjare, including applicants' specifically claimed surfactant and concentration, for the purpose of wetting a polymer surface which can result in a more constant etch rate (column 11, lines 18-21).

13. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Everhart as applied to claim 1 above, and further in view of Crooks et al. (US 5,885,753).

Everhart differs in failing to teach wherein said substrate is patterned with a resist, **in claim 20** wherein said resist is hydrophobic, **in claim 21**.

Crooks teaches a diacetylenic SAM composed of HS(CH<sub>2</sub>)<sub>10</sub>C≡CC≡C(CH<sub>2</sub>)<sub>10</sub>COOH (which is the same as applicants' hydrophobic resist) structures on was used as a negative photoresist and image was transferred into an Au substrate (column 8, lines 20-23).



It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Everhart by using a Crooks' resist, which is hydrophobic for the purpose of improving the stability of the SAMs, which can be employed as an adhesion layer (column 1, lines 28-34 and column 4, lines 41-46).

***Claim Rejections - 35 USC § 102.***

14. Claims 1, 6, and 14-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Fjare (US 5,292,445).

Fjare teaches a wet-etch composition that includes a polymer additive (same as applicants' second additive that is a surfactant) with surfactant properties and which includes polyethylene glycol (column 11, lines 25-30) and include straight or branched alcohols having from 1 to about 12 carbon atoms and at least one OH group (column 7, lines 33-38). The above reads on,

A wet etching system comprising:

a) a liquid etching solution; and

b) at least one additive. Since Fjare's wet-etch composition is the same as applicants' wet etching system, then using Fjare's composition in the same manner as claimed by applicants would inherently result in,

A wet etching system for selectively patterning substrate having regions covered with self-assembled monolayers (SAMs), thereby controlling the etch profile, and at

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least one additive having a higher affinity to the regions of said substrate covered with SAMs than to the other regions of said substrate, **in claim 1**.

The said above also reads on,

the system , which contains additionally a second additive, **in claim 14**;

wherein said second additive is a surfactant, **in claim 15**;

wherein said surfactant is a poly(ethyleneglycol), **in claim 16**.

Fjare's straight alcohol having from 1 to 12 carbon atoms and at least one OH group, for example, methanol, ethanol, propanol, . . . and the like (column 7, lines 33-38) encompasses and reads on,

wherein said alcohol is 1-octanol, **in claim 6**.

### ***Claim Rejections - 35 USC § 103***

15. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fjare (US '445) as applied to claim 1 above.

Fjare differs in failing to teach wherein said poly(ethyleneglycol) is dedecylhexa(ethyleneglycol), (C<sub>12</sub>PEG<sub>6</sub>), **in claim 17**.

Since Fjare teaches polymer additives with surfactant properties include polyethylene glycols are known, then it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to use any known polyethylene glycol as taught by Fjare, including applicants' specifically claimed surfactant and concentration, which would have been suitable in the absence of an unexpected result.

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Fjare differs in failing to teach, wherein said C<sub>12</sub>PEG<sub>6</sub> is present in a concentration in the range of 0.5 mM to about 10 mM, preferably 2 mM, **in claim 18**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to select any concentration of in the Fjare reference, including applicants' claimed concentration that would effectively accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

16. Claims 2-5, 7-9, and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fjare (US '445) as applied to claim 1 above, and further in view of Everhart et al. (US 6,060,256) and Crooks et al. (US 5,885,753).

Fjare differs in failing to teach,

wherein said liquid etching solution comprises a KCN/Oxygen etching composition, **in claim 2**; and

wherein said nonpolar additive comprises a compound having an alkyl chain and a small, polar head group, **in claims 3-9**.

Everhart teaches gold samples were coated with an ethanol solution of hexadecane thio (HDT) to form a SAM (self assembling monolayer) and then etched in an aqueous solution of potassium cyanide containing potassium hydroxide while bubbling air (oxygen), (column 12, lines 48-58), which reads on

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wherein said etching solution comprises a KCN/Oxygen etching composition, in **claim 2**;

wherein said at least one additive is nonpolar and is adapted to form an ordered layer on said substrate, in **claim 3**;

wherein said nonpolar additive comprises a compound having an alkyl chain and a small polar head group, in **claim 4**;

wherein said compound is selected from the group consisting of alcohols, carboxylic acids, amines, sulfates, phosphates and alkanethiols, in **claim 5**;

wherein said compound is alkanethiol, which is a linear alkanethiol of the general formula  $\text{HS}-(\text{CH}_2)_{n-1}-\text{CH}_3$ , where  $6 < n < 24$ , in **claims 7 and 8**, and

wherein said alkanethiol is hexadecanethiol, in **claim 9**; and

wherein said substrate is selected from the group consisting of Au, Ag, Pd and Cu, in **claim 19**.

Since it is known that the presence of a self assembling monolayer (SAM) increases the resistance to chemical etchants (Everhart, column 12, lines 37-39), then it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Fjare by using Everhart's etching solution for the purpose of determining if thiolated protein forms a protective self assembling monolayer (SAM) on gold (column 12, lines 41-43).

Fjare in view of Everhart differs in failing to teach wherein said substrate is patterned with a resist, in **claim 20** wherein said resist is hydrophobic, in **claim 21**.

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Crooks teaches a diacetylenic SAM composed of  $\text{HS}(\text{CH}_2)_{10}\text{C}\equiv\text{CC}\equiv\text{C}(\text{CH}_2)_{10}\text{COOH}$  (which is the same as applicants' hydrophobic resist) structures on was used as a negative photoresist and image was transferred into an Au substrate (column 8, lines 20-23).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Fjare in view of Everhart by using Crooks' resist, which is hydrophobic for the purpose of improving the stability of the SAMs, which can be employed as an adhesion layer (column 1, lines 28-34 and column 4, lines 41-46).

17. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fjare (US '445), as applied to claim 1 above, and further in view of in view of Everhart (US '256).

Fjare differs in failing to teach said hexadecanethiol is present in a concentration in the range of about 0.005 mM to about 0.07mM, preferably 0.2mM.

However, the reference of Everhart illustrates that the specific thiol is known. As a result, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any concentration of hexadecanethiol in the reference of Everhart, including applicants' claimed concentration that would effectively accomplish the disclosed composition because it has been held that there is no invention where the difference in proportions is not critical and was ascertained by routine experimentation because the determination of workable ranges is not considered inventive. See *In re Swain and Adams*, 70 USPQ 412 (CPA 1946).

***Allowable Subject Matter***

18. Claims 11-13 are objected to being dependent upon a rejected base claim but would be allowable if rewritten to include all of the limitations of any intervening claims.

19. The following is a statement of reasons for the indication of allowable subject matter:

As to claims 11 and 12, respectively, the prior art of record taken alone or in combination fails to suggest, teach or render obvious an alkanethiol, which is a perfluoroalkanethiol and said perfluoroalkanethiol has a general selected from the group consisting of  $F_3C-(CF_2)_{n-3}-CH_2-CH_2-SH$ ,  $CF_3-(CF_2)_{(n-3)}-CO-NH-CH_2-CH_2-SH$  or  $CF_3-(CH_2)_{(n-1)}-SH$ , in combination with the rest of the limitations of the said claims;

As to claim 13, the prior art of record taken alone or in combination fails to suggest, teach or render obvious, wherein said non-polar additive is a disulfide, in combination with the rest of the limitations of the said claim.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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December 12, 2004

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**  
*Nadine Norton*